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(54) **LOOSEFILL INSULATION BLOWING MACHINE**

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(51) **Int. Cl.**

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B02C 18/22	(2006.01)
B02C 23/20	(2006.01)
B02C 18/08	(2006.01)

(52) **U.S. Cl.**

CPC ***E04F 21/085*** (2013.01); ***B02C 18/08*** (2013.01); ***B02C 18/22*** (2013.01); ***B02C 18/2216*** (2013.01); ***B02C 18/2291*** (2013.01); ***B02C 23/20*** (2013.01)

(58) **Field of Classification Search**

CPC E04F 21/085; B02C 18/08; B02C 18/22; B02C 18/2216; B02C 18/2291; B02C 23/20

See application file for complete search history.

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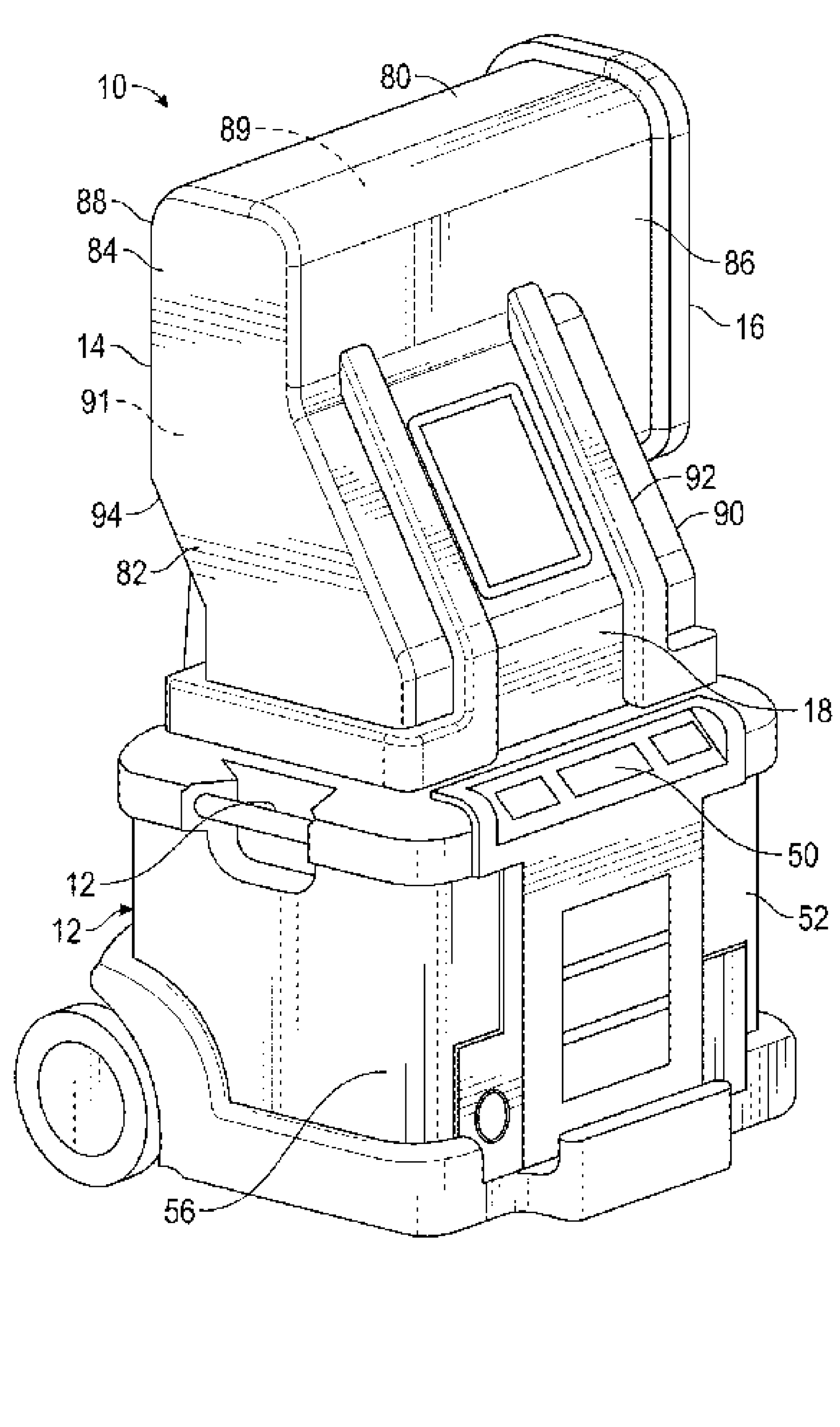
(57) **ABSTRACT**

A machine for distributing loosefill insulation material from a package of compressed loosefill insulation material. The machine includes a chute having an inlet end and an outlet end. The inlet end receives compressed loosefill insulation material. The chute has a first portion and a second portion. The first portion forms an angle with the second portion. A shredding chamber receives the compressed loosefill insulation material from the chute. The shredding chamber forms conditioned loosefill insulation material. A discharge mechanism is configured to distribute the conditioned loosefill insulation material into an airstream. A blower provides the airstream. The angle between the first and second portions of the chute is configured to form a bend in the package of compressed loosefill insulation material. The bend in the package of compressed loosefill insulation material is configured to control the descent and direction of the loosefill insulation material entering the shredding chamber.

10 Claims, 10 Drawing Sheets



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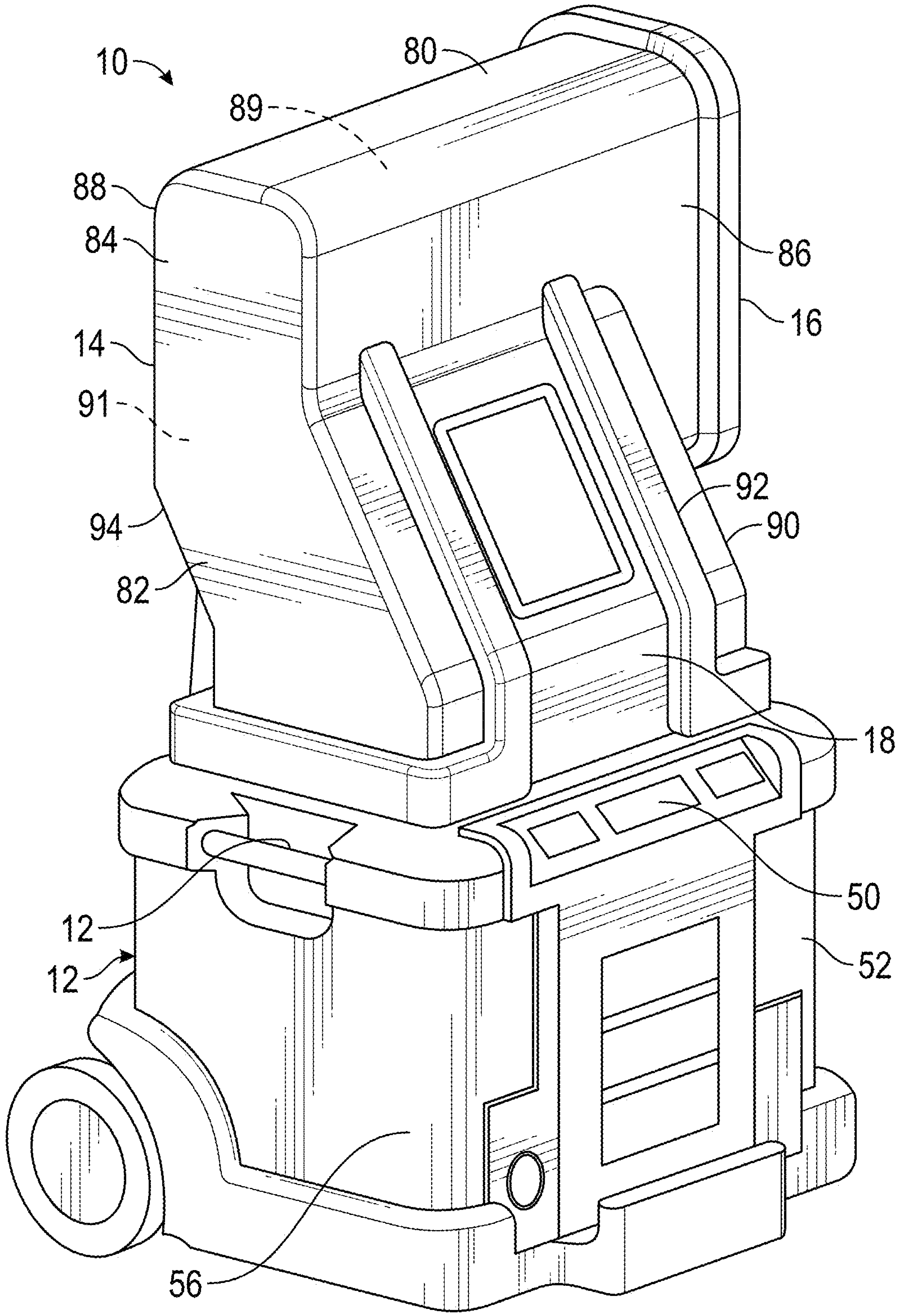


FIG. 1

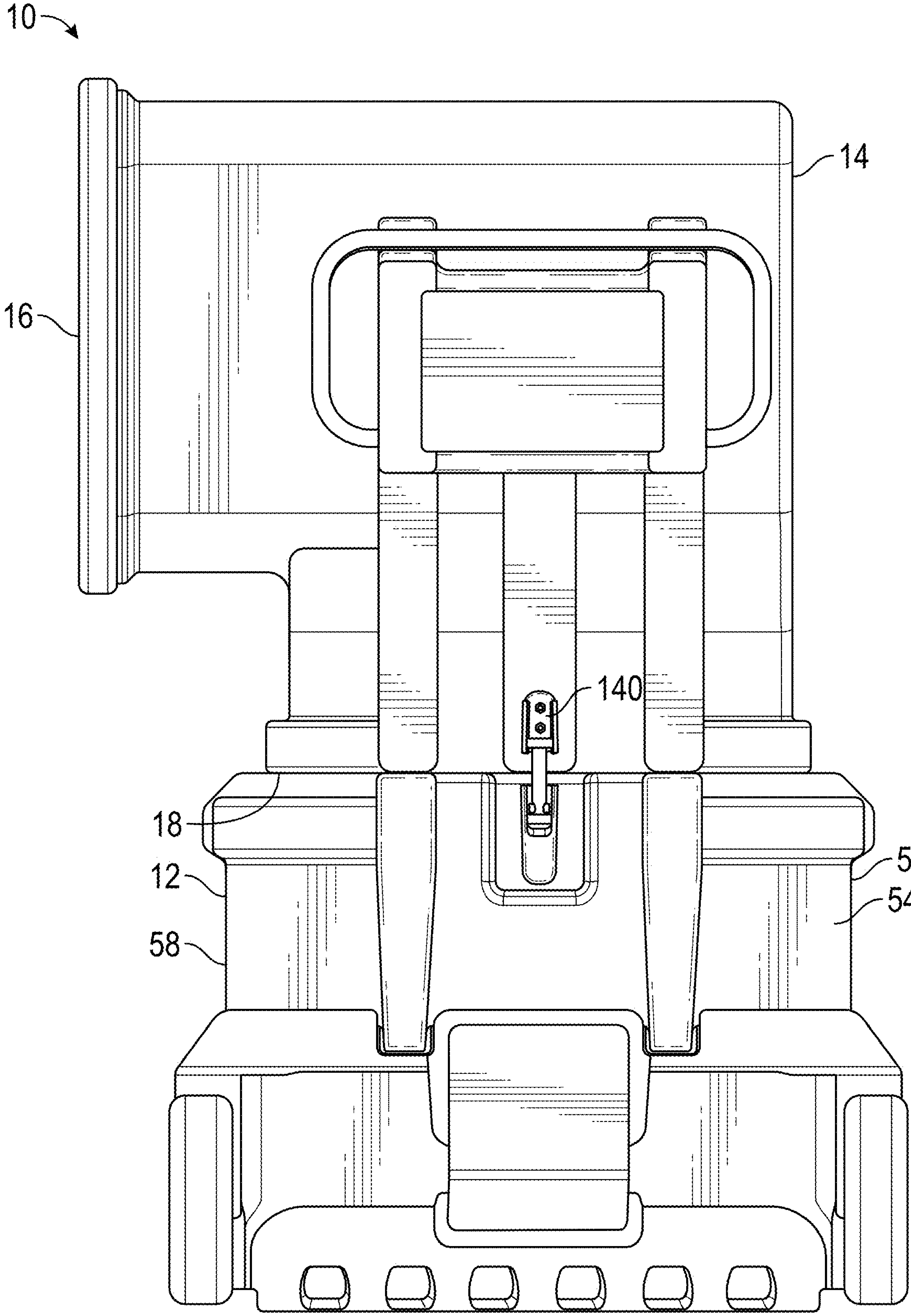
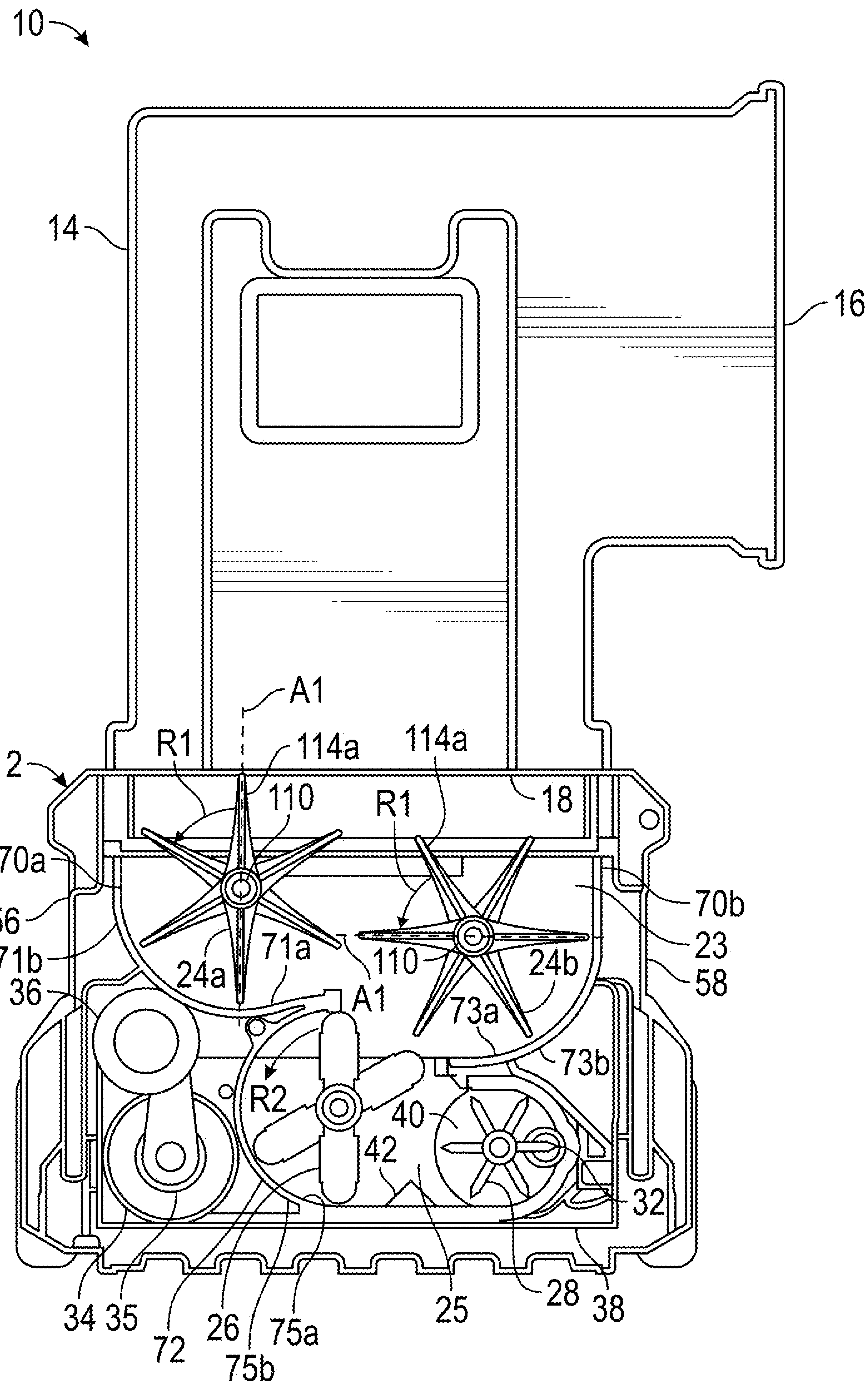


FIG. 2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58
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FIG. 3

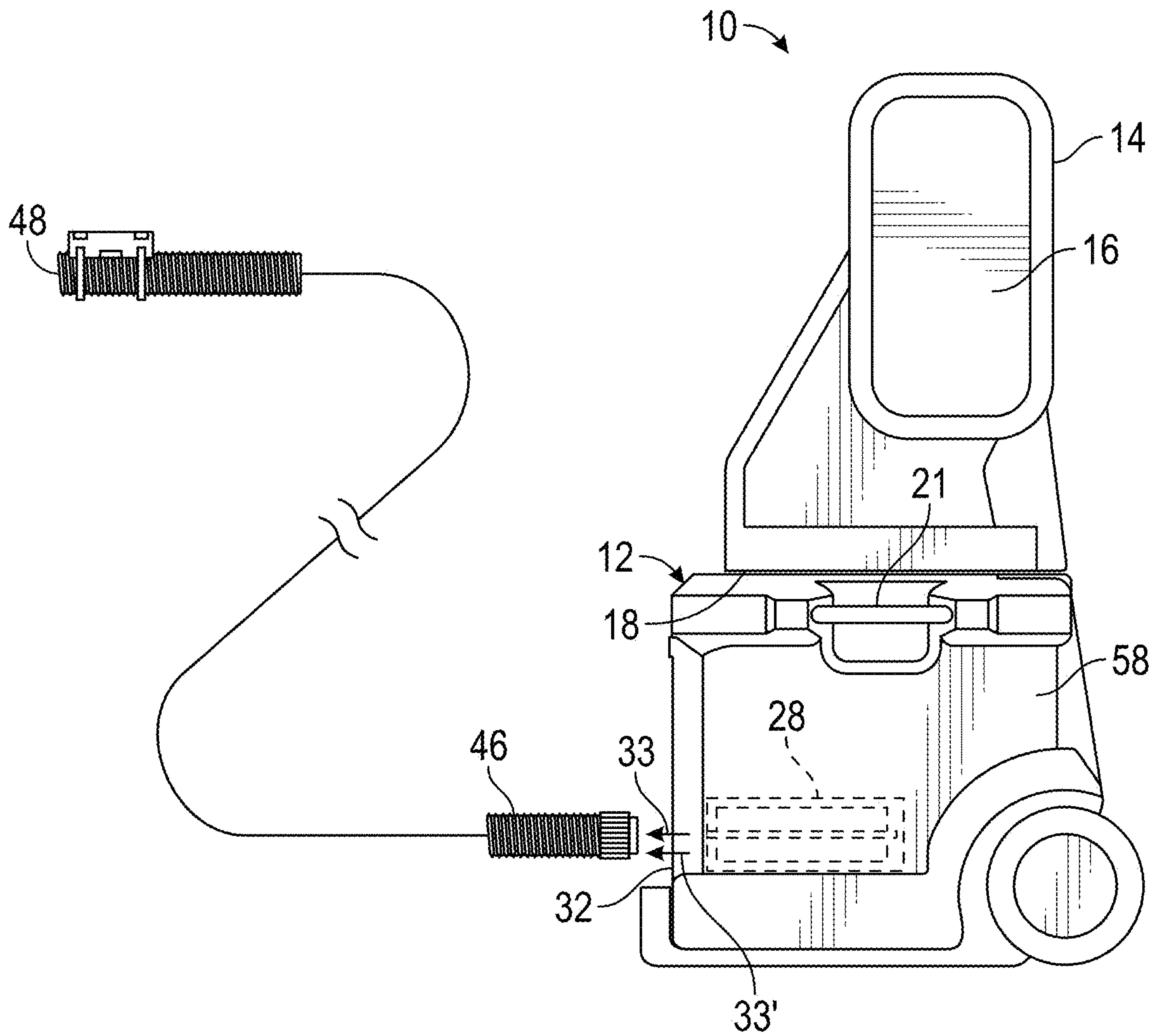

FIG. 4

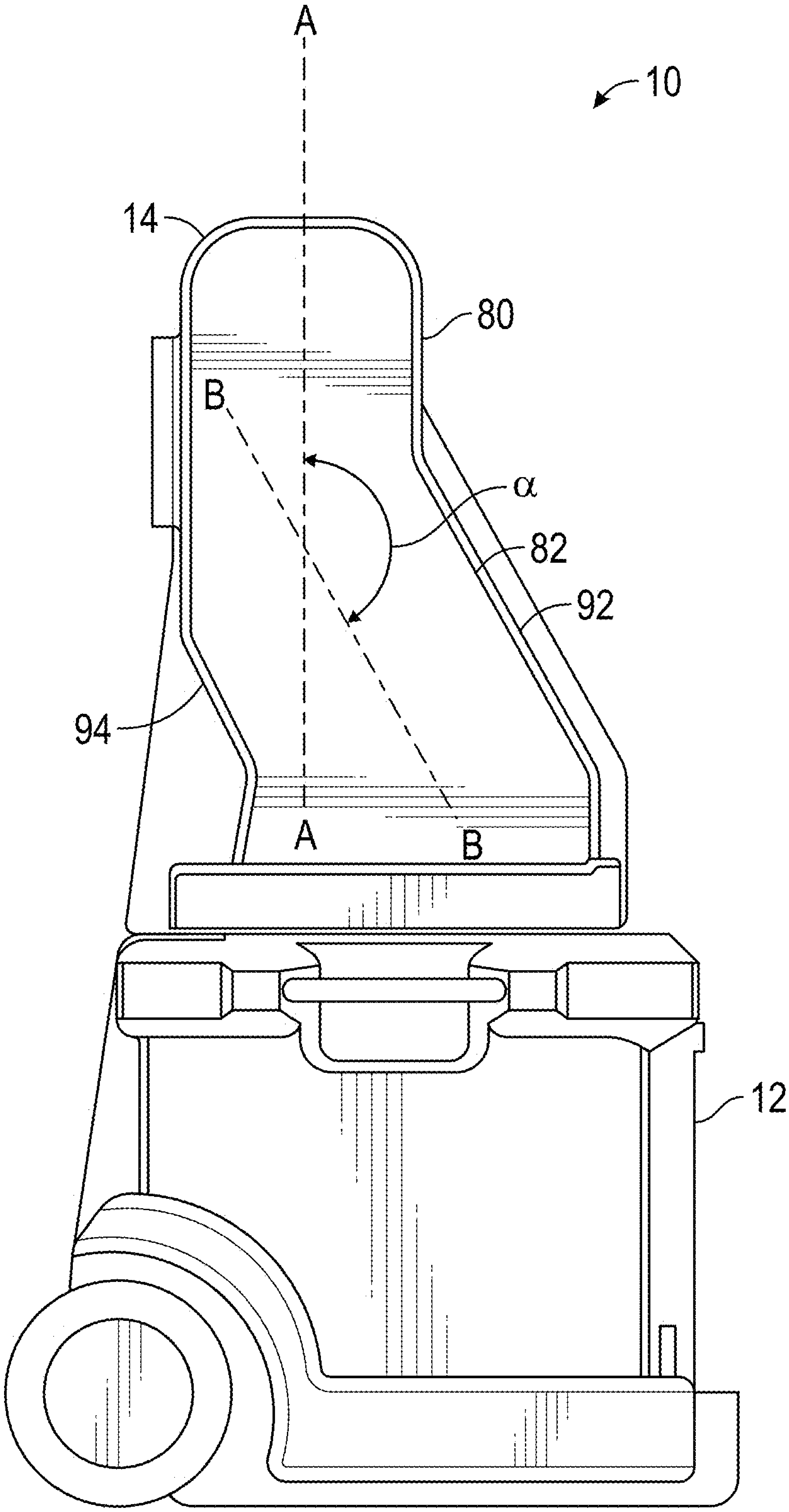

FIG. 5

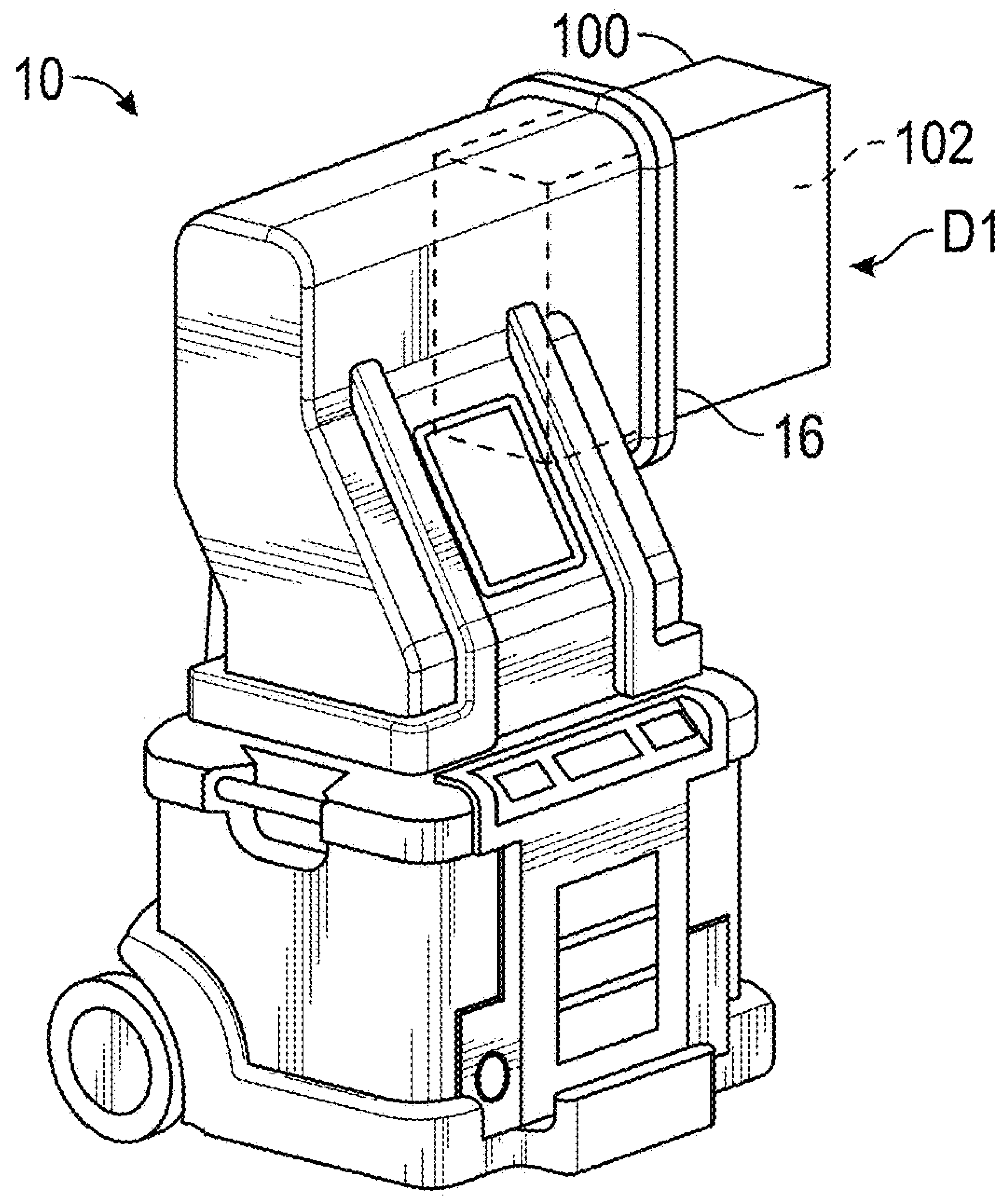

FIG. 6A

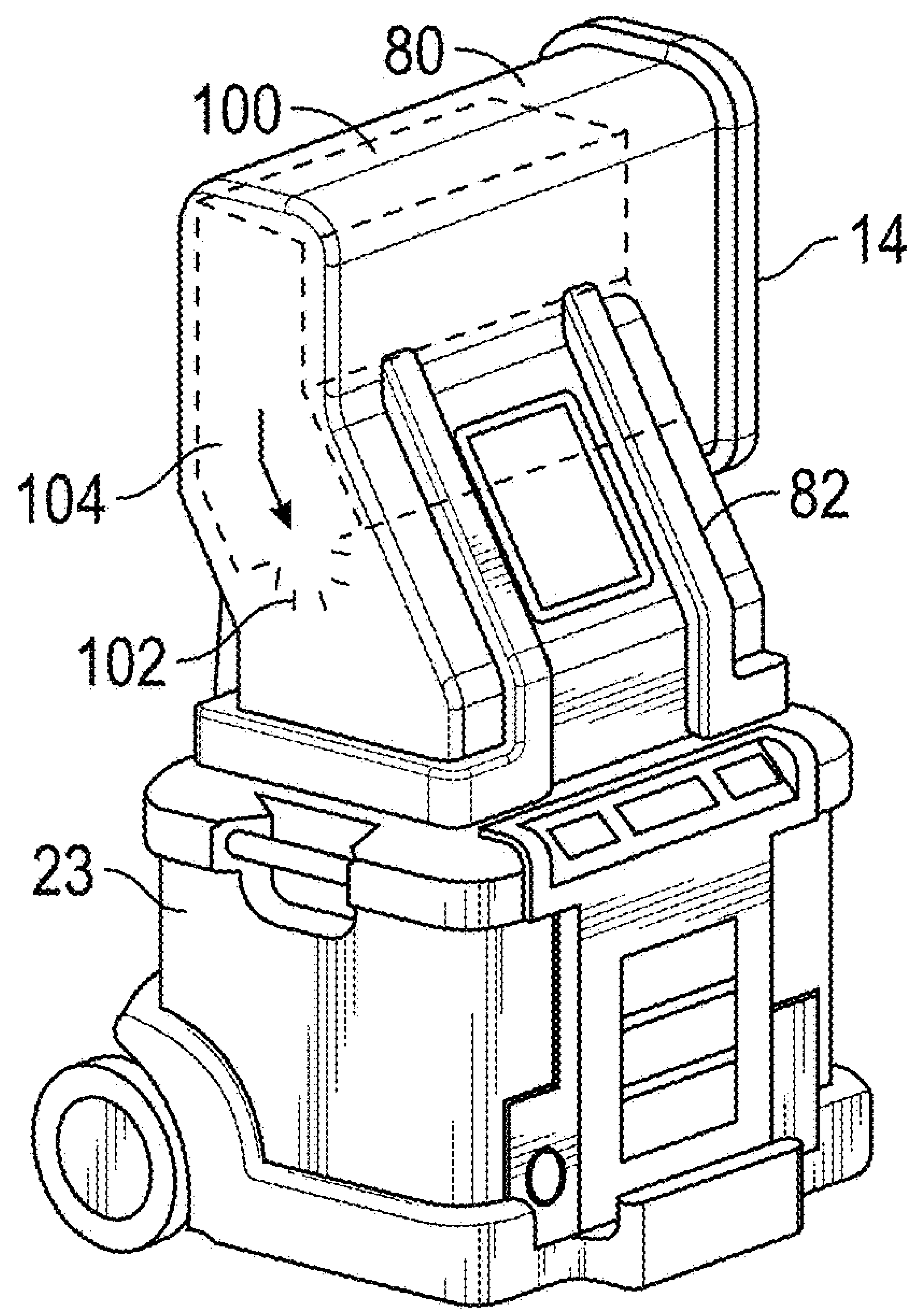

FIG. 6B

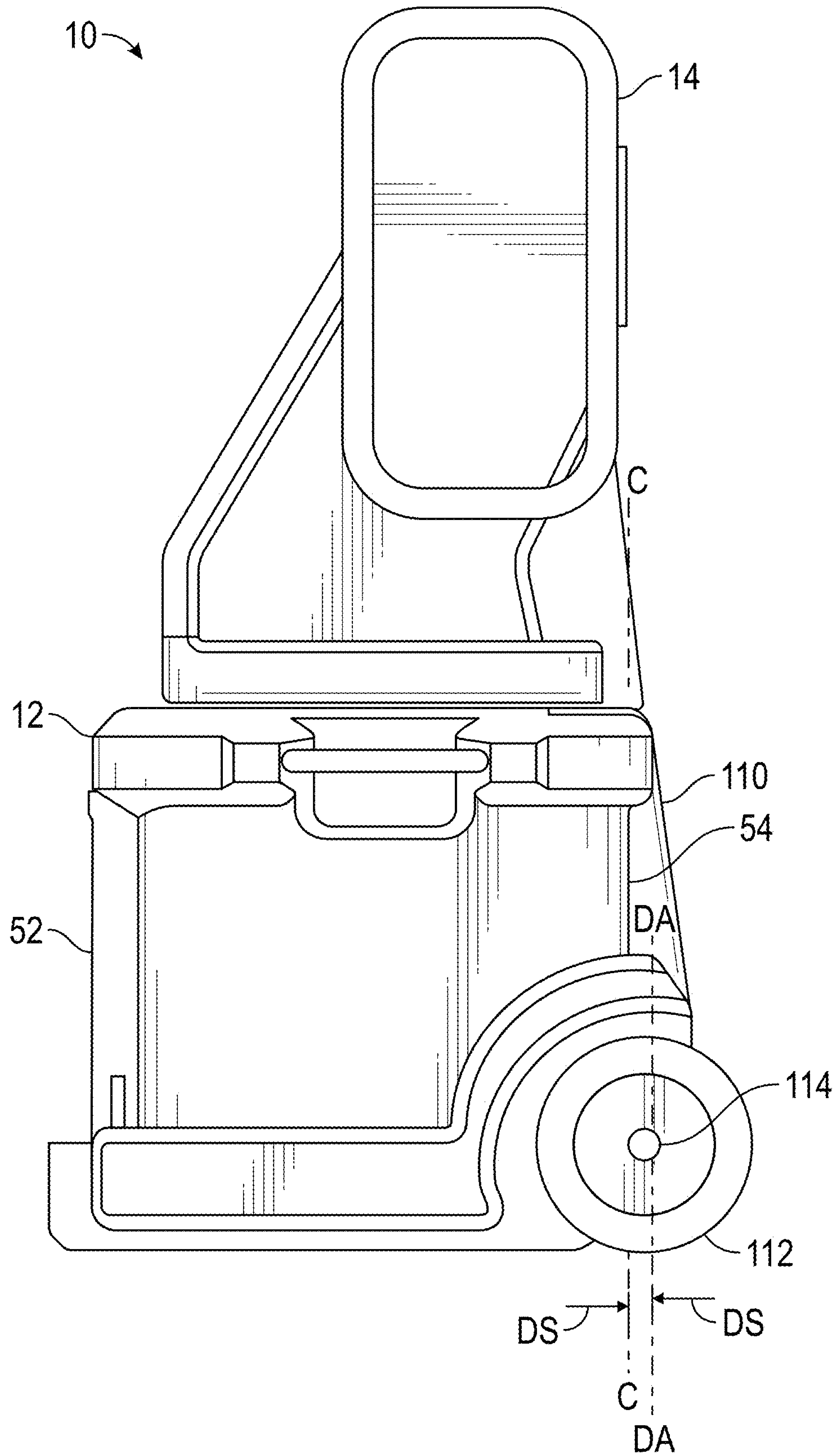

FIG. 7

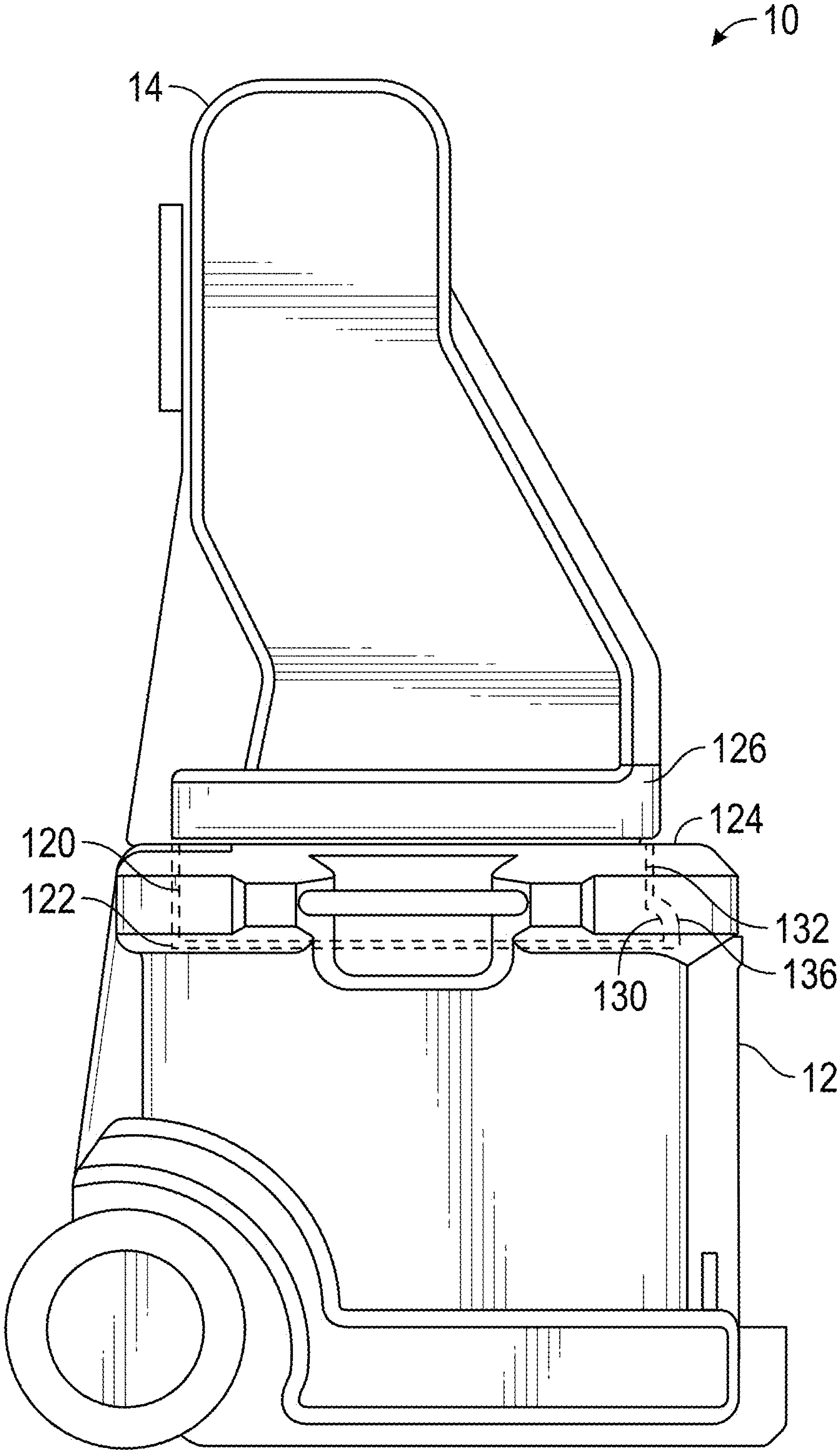

FIG. 8

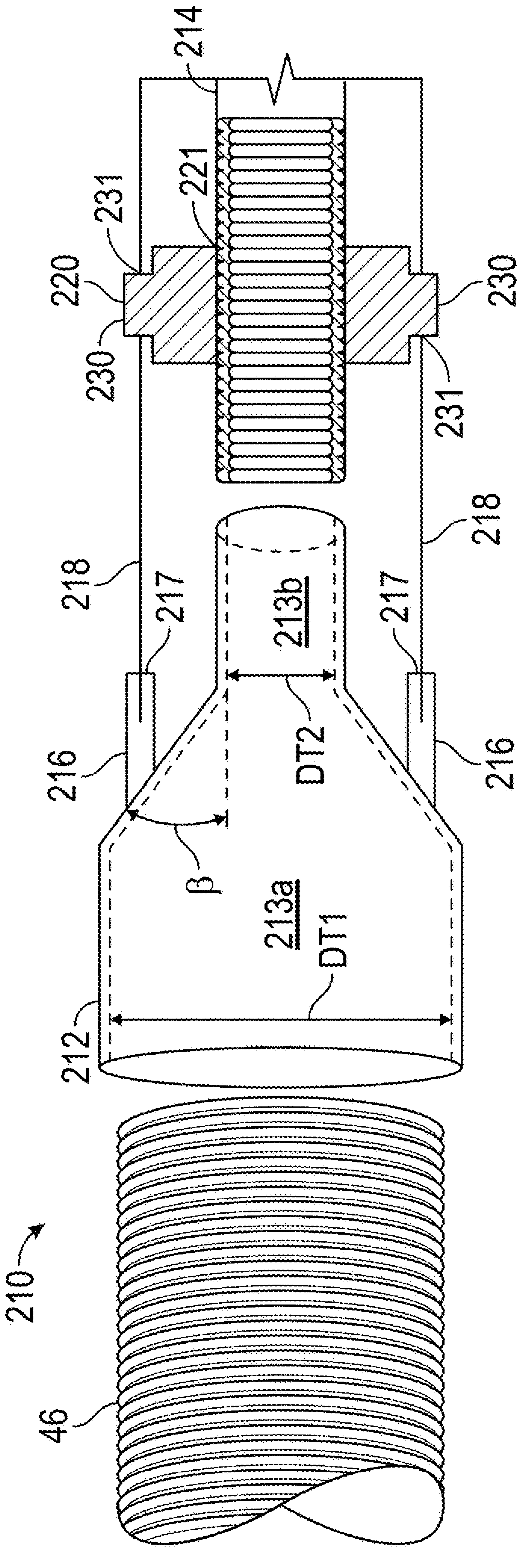
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FIG. 9

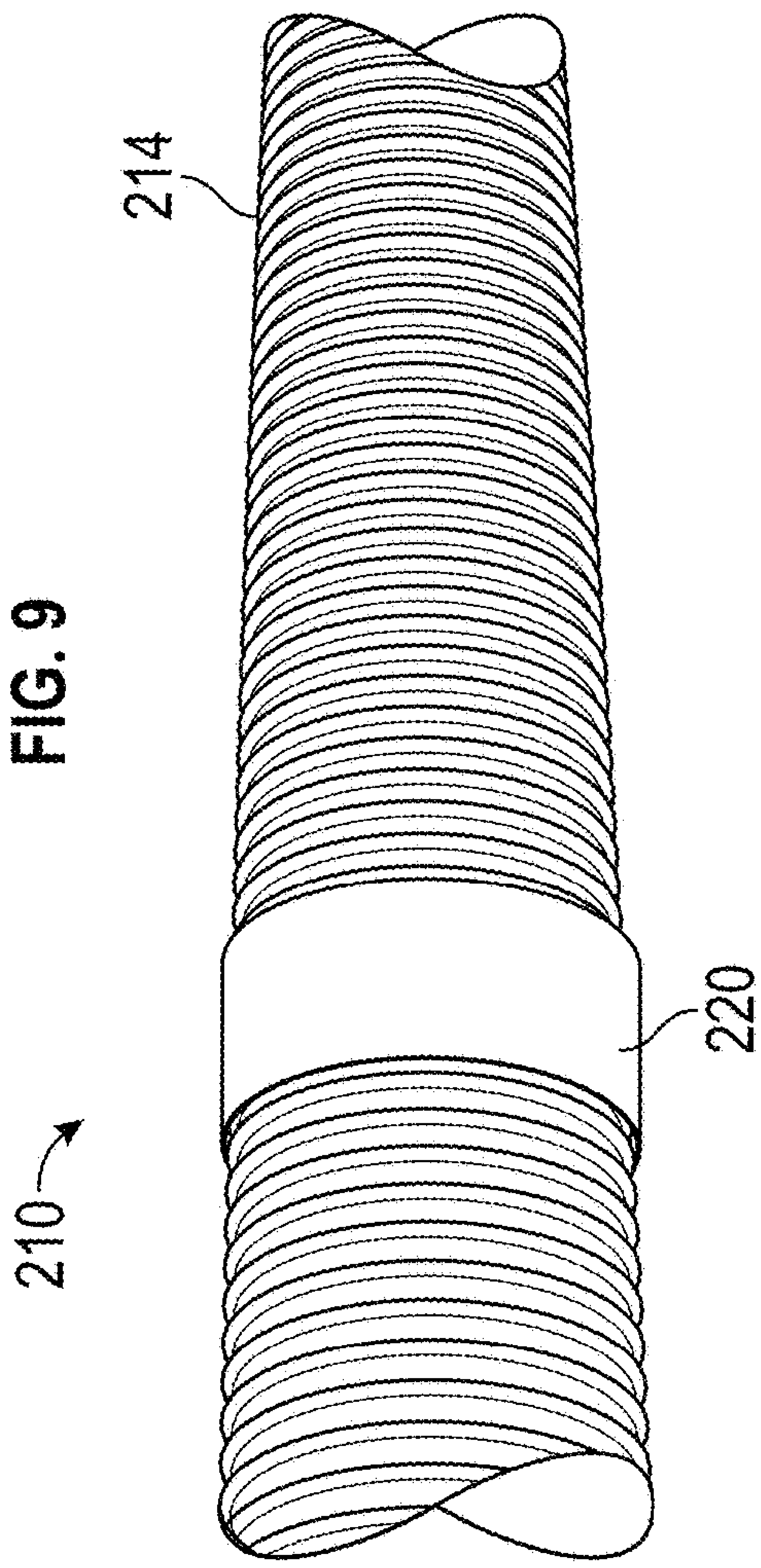
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FIG. 10

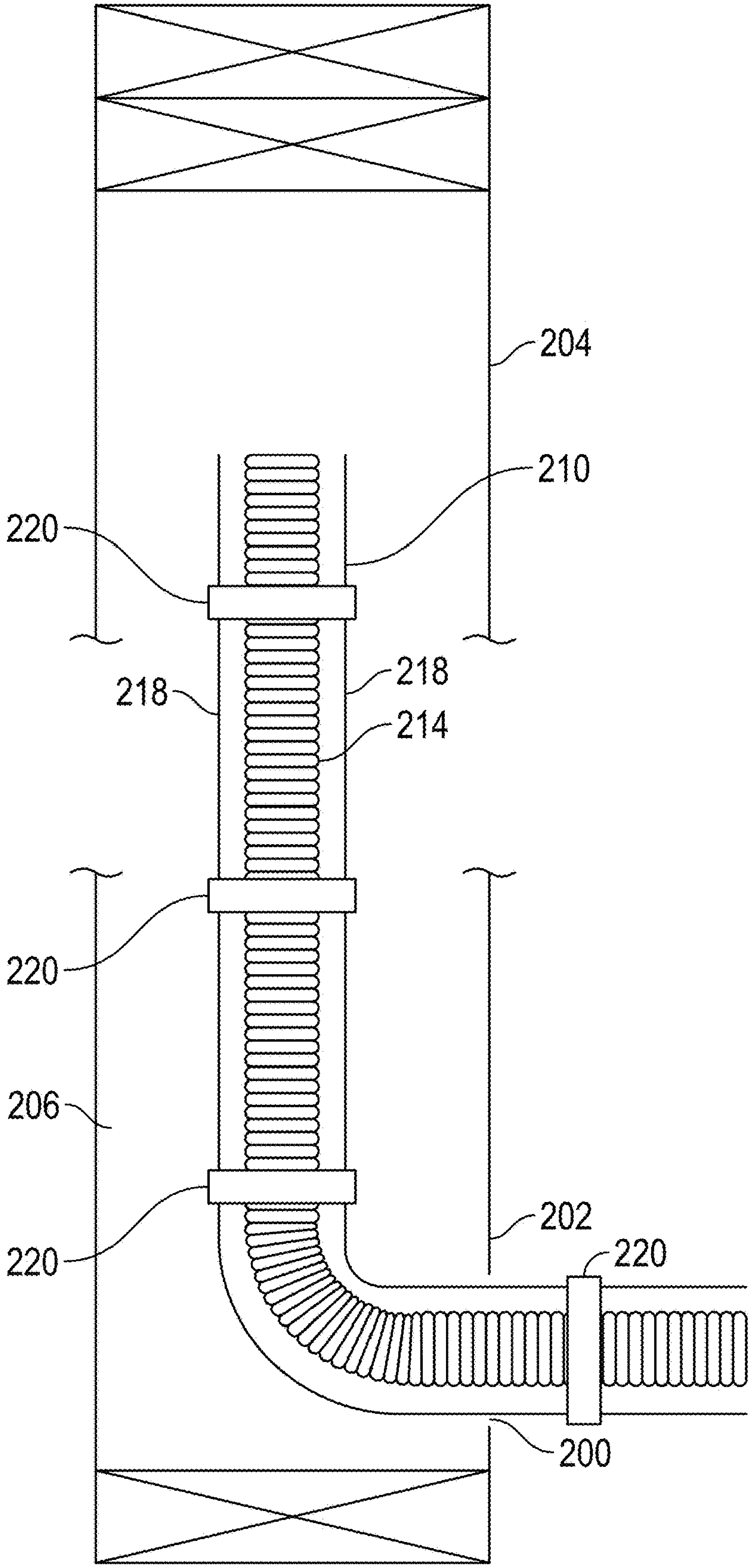

FIG. 11

LOOSEFILL INSULATION BLOWING MACHINE

RELATED APPLICATIONS

This application claims the benefit of U.S. Utility patent application Ser. No. 15/267,182, filed Sep. 16, 2016, which claims the benefit of U.S. Provisional Patent Application No. 62/219,418, filed Sep. 16, 2015, the disclosures of which are incorporated herein by reference in their entireties.

BACKGROUND

When insulating buildings and installations, a frequently used insulation product is loosefill insulation material. In contrast to the unitary or monolithic structure of insulation materials formed as batts or blankets, loosefill insulation material is a multiplicity of discrete, individual tufts, cubes, flakes or nodules. Loosefill insulation material is usually applied within buildings and installations by blowing the loosefill insulation material into an insulation cavity, such as a wall cavity or an attic of a building. Typically, loosefill insulation material is made of glass fibers although other mineral fibers, organic fibers, and cellulose fibers can be used.

Loosefill insulation material, also referred to as blowing wool, is typically compressed in packages for transport from an insulation manufacturing site to a building that is to be insulated. Typically the packages include compressed loosefill insulation material encapsulated in a bag. The bags can be made of polypropylene or other suitable material. During the packaging of the loosefill insulation material, it is placed under compression for storage and transportation efficiencies. Typically, the loosefill insulation material is packaged with a compression ratio of at least about 10:1.

The distribution of loosefill insulation material into an insulation cavity typically uses an insulation blowing machine that conditions the loosefill insulation material to a desired density and feeds the conditioned loosefill insulation material pneumatically through a distribution hose. Insulation blowing machines typically contain one or more motors configured to drive shredding mechanisms, rotary valves and discharge mechanisms. The motors, shredding mechanisms, rotary valves and discharge mechanisms often operate at elevated sound levels.

It would be advantageous if insulation blowing machines could be improved.

SUMMARY

The above objects as well as other objects not specifically enumerated are achieved by a machine for distributing loosefill insulation material from a package of compressed loosefill insulation material. The machine includes a chute having an inlet end and an outlet end. The inlet end is configured to receive compressed loosefill insulation material. The chute has a first portion in fluid communication with a second portion. The first portion forms an angle with the second portion. A shredding chamber is configured to receive the compressed loosefill insulation material from the outlet end of the chute. The shredding chamber includes a plurality of shredders configured to shred, pick apart and condition the loosefill insulation material thereby forming conditioned loosefill insulation material. A discharge mechanism is mounted to receive the conditioned loosefill insulation material exiting the shredding chamber. The discharge mechanism is configured to distribute the conditioned loosefill insulation material into an airstream. A blower is configured to provide the airstream flowing through the discharge mechanism. The angle between the first portion of the chute and the second portion of the chute is configured to form a bend in the package of compressed loosefill insulation material. The bend in the package of compressed loosefill insulation material is configured to control the descent and direction of the loosefill insulation material entering the shredding chamber.

According to this invention there is also provided a machine for distributing loosefill insulation material from a package of compressed loosefill insulation material. The machine includes a chute having an inlet end and an outlet end. The inlet end is configured to receive compressed loosefill insulation material. A lower unit is configured to receive the compressed loosefill insulation material from the outlet end of the chute. The lower unit includes a shredding chamber having a plurality of shredders configured to shred, pick apart and condition the loosefill insulation material. The lower unit has a back panel forming a vertical plane. The lower unit also has an axle supporting opposing spaced apart wheels configured for rotation. The axle is supported by a plurality of support segments formed integral to the back panel. A discharge mechanism is mounted to receive the conditioned loosefill insulation material exiting the shredding chamber. The discharge mechanism is configured to distribute the conditioned loosefill insulation material into an airstream. A blower is configured to provide the airstream flowing through the discharge mechanism. A rotational center of the wheels is located a distance outward from the vertical plane formed by the back panel of the lower unit, such as to increase the stability of the machine during operating and transport.

According to this invention there is also provided a machine for distributing loosefill insulation material from a package of compressed loosefill insulation material. The machine includes a chute having an inlet end and an outlet end. The inlet end is configured to receive compressed loosefill insulation material. The chute has a lower extension and the lower extension has a projection that extends across a front edge of the lower extension. A lower unit has a shredding chamber configured to receive the compressed loosefill insulation material from the outlet end of the chute. The shredding chamber includes a plurality of shredders configured to shred, pick apart and condition the loosefill insulation material. The lower unit has a cavity configured to receive the lower extension of the chute. A discharge mechanism is mounted to receive the conditioned loosefill insulation material exiting the shredding chamber. The discharge mechanism is configured to distribute the conditioned loosefill insulation material into an airstream and a blower is configured to provide the airstream flowing through the discharge mechanism. The chute and the lower unit are secured together in a manner such as to require rotation of the chute to separate the chute from the lower unit.

Various objects and advantages of the loosefill insulation blowing machine will become apparent to those skilled in the art from the following detailed description of the preferred embodiment, when read in light of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front perspective view of a loosefill insulation blowing machine.

FIG. **2** is a rear elevational view of the loosefill insulation blowing machine of FIG. **1**.

FIG. **3** is a front elevational view, partially in cross-section, of the loosefill insulation blowing machine of FIG. **1**.

FIG. **4** is a side elevational view of the loosefill insulation blowing machine of FIG. **1**, illustrating a distribution hose.

FIG. **5** is a side elevational view of the loosefill insulation blowing machine of FIG. **1**, illustrating a chute having first and second portions.

FIG. **6A** is a perspective view of the loosefill insulation blowing machine of FIG. **5**, illustrating loading of a package of loosefill insulation material into the first portion of the chute.

FIG. **6B** is a perspective view of the loosefill insulation blowing machine of FIG. **5**, illustrating loading of a package of loosefill insulation material into the second portion of the chute.

FIG. **7** is side elevational view of the loosefill insulation blowing machine of FIG. **1**, illustrating an offset wheel axle.

FIG. **8** is side elevational view of the loosefill insulation blowing machine of FIG. **1**, illustrating a lower extension of the chute seating within a cavity in the lower unit.

FIG. **9** is a side elevational view of a distribution hose assembly.

FIG. **10** is a side elevational view of the distribution hose assembly of FIG. **9**, illustrating a second distribution hose and a connecting member.

FIG. **11** is a front view of the distribution hose assembly of FIG. **9**, shown within an insulation cavity.

DETAILED DESCRIPTION OF THE INVENTION

The loosefill insulation blowing machine will now be described with occasional reference to the specific embodiments of the loosefill insulation blowing machine. The loosefill insulation blowing machine may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the loosefill insulation blowing machine to those skilled in the art.

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the loosefill insulation blowing machine belongs. The terminology used in the description of the loosefill insulation blowing machine herein is for describing particular embodiments only and is not intended to be limiting of the loosefill insulation blowing machine. As used in the description of the loosefill insulation blowing machine and the appended claims, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

Unless otherwise indicated, all numbers expressing quantities of dimensions such as length, width, height, and so forth as used in the specification and claims are to be understood as being modified in all instances by the term "about." Accordingly, unless otherwise indicated, the numerical properties set forth in the specification and claims are approximations that may vary depending on the desired properties sought to be obtained in embodiments of the loosefill insulation blowing machine. Notwithstanding that the numerical ranges and parameters setting forth the broad scope of the loosefill insulation blowing machine are approximations, the numerical values set forth in the specific examples are reported as precisely as possible. Any numerical values, however, inherently contain certain errors necessarily resulting from error found in their respective measurements.

In accordance with the illustrated embodiments, the description and figures disclose a loosefill insulation blowing machine. The loosefill insulation blowing machine includes a chute and a plurality of shredders configured to shred, pick apart and condition the loosefill insulation material. The chute includes a first portion in fluid communication with a second portion, with the first portion forming an angle with the second portion. The angle is configured to provide a controlled descent for the loosefill insulation material as the loosefill insulation transitions from the chute and enters the shredding chamber. The loosefill insulation blowing machine also includes wheels having a rotational center located a distance from the substantially vertical plane formed by the back panel of the machine, such as to increase the stability of the machine during operating and transport. The loosefill insulation blowing machine further includes a lower unit secured to the chute in a manner such as to require rotation of the chute to separate the chute from the lower unit. The loosefill insulation blowing machine also includes a distribution hose assembly configured to receive an airstream flowing through a discharge mechanism and convey the airstream in a downstream direction. The distribution hose assembly includes a distribution hose connected to the machine and a second distribution hose extending from the distribution hose.

The term "loosefill insulation", as used herein, is defined to mean any insulating materials configured for distribution in an airstream. The term "finely conditioned", as used herein, is defined to mean the shredding, picking apart and conditioning of loosefill insulation material to a desired density prior to distribution into an airstream.

Referring now to FIGS. **1-4**, a loosefill insulation blowing machine (hereafter "blowing machine") is shown generally at **10**. The blowing machine **10** is configured for conditioning compressed loosefill insulation material and further configured for distributing the conditioned loosefill insulation material to desired locations, such as for example, insulation cavities. The blowing machine **10** includes a lower unit **12** and a chute **14**. The lower unit **12** is connected to the chute **14** by one or more fastening mechanisms (not shown) configured to readily assemble and disassemble the chute **14** to the lower unit **12**. The chute **14** has an inlet end **16** and an outlet end **18**.

Referring again to FIGS. **1-4**, the inlet end **16** of the chute **14** is configured to receive compressed loosefill insulation material. The compressed loosefill insulation material is guided within the interior of the chute **14** to the outlet end **18**, wherein the loosefill insulation material is introduced to a shredding chamber **23** as shown in FIG. **3**.

Referring again to FIGS. **1**, **2** and **4**, optionally the lower unit **12** can include one or more handle segments **21**, configured to facilitate ready movement of the blowing machine **10** from one location to another. However, it should be understood that the one or more handle segments **21** are not necessary to the operation of the blowing machine **10**.

Referring again to FIGS. **1-4**, the chute **14** can include an optional bail guide (not shown for purposes of clarity) mounted at the inlet end **16** of the chute **14**. The bail guide is configured to urge a package of compressed loosefill insulation material against an optional cutting mechanism (also not shown for purposes of clarity) as the package of compressed loosefill insulation material moves further into the chute **14**. The bail guide and the cutting mechanism can have any desired structure and operation.

Referring now to FIGS. **1** and **2**, the lower unit **12** includes a front panel **52**, a back panel **54**, a left side panel **56** and a right side panel **58**. In the illustrated embodiment, the panels **52**, **54**, **56** and **58** are formed from a polymeric material. However, in other embodiments, the panels **52**, **54**, **56** and **58** can be formed from other desired materials including the non-limiting example of aluminum.

Referring now to FIG. **3**, the shredding chamber **23** is mounted at the outlet end **18** of the chute **14**. The shredding chamber **23** includes first and second low speed shredders **24***a*, **24***b* and one or more agitators **26**. The first and second low speed shredders **24***a*, **24***b* are configured to shred, pick apart and condition the loosefill insulation material as the loosefill insulation material is discharged into the shredding chamber **23** from the outlet end **18** of the chute **14**. The agitator **26** is configured to finely condition the loosefill insulation material to a desired density as the loosefill insulation material exits the first and second low speed shredders **24***a*, **24***b*. It should be appreciated that although a quantity of two low speed shredders **24***a*, **24***b* and a lone agitator **26** are illustrated, any desired quantity of low speed shredders **24***a*, **24***b* and agitators **26** can be used. Further, although the blowing machine **10** is shown with first and second low speed shredders **24***a*, **24***b*, any type of separator, such as a clump breaker, beater bar or any other mechanism, device or structure that shreds, picks apart and conditions the loosefill insulation material can be used.

Referring again to FIG. **3**, the first and second low speed shredders **24***a*, **24***b* rotate in a counter-clockwise direction R**1** and the agitator **26** rotates in a counter-clockwise direction R**2**. Rotating the low speed shredders **24***a*, **24***b* and the agitator **26** in the same counter-clockwise direction allows the low speed shredders **24***a*, **24***b* and the agitator **26** to shred and pick apart the loosefill insulation material while substantially preventing an accumulation of unshredded or partially shredded loosefill insulation material in the shredding chamber **23**. However, in other embodiments, each of the low speed shredders **24***a*, **24***b* and the agitator **26** could rotate in a clock-wise direction or the low speed shredders **24***a*, **24***b* and the agitator **26** could rotate in different directions provided the relative rotational directions allow finely shredded loosefill insulation material to be fed into the discharge mechanism **28** while preventing a substantial accumulation of unshredded or partially shredded loosefill insulation material in the shredding chamber **23**.

Referring again to FIG. **3**, the agitator **26** is configured to finely condition the loosefill insulation material, thereby forming finely conditioned loosefill insulation material and preparing the finely conditioned loosefill insulation material for distribution into an airstream. In the embodiment illustrated in FIG. **3**, the agitator **26** is positioned vertically below the first and second low speed shredders **24***a*, **24***b*. Alternatively, the agitator **26** can be positioned in any desired location relative to the first and second low speed shredders **24***a*, **24***b*, sufficient to receive the loosefill insulation material from the first and second low speed shredders **24***a*, **24***b*, including the non-limiting example of being positioned horizontally adjacent to the first and second low speed shredders **24***a*, **24***b*. In the illustrated embodiment, the agitator **26** is a high speed shredder. Alternatively, the agitator **26** can be any type of shredder, such as a low speed shredder, clump breaker, beater bar or any other mechanism that finely conditions the loosefill insulation material and prepares the finely conditioned loosefill insulation material for distribution into an airstream.

In the embodiment illustrated in FIG. **3**, the first and second low speed shredders **24***a*, **24***b* rotate at a lower rotational speed than the rotational speed of the agitator **26**. The first and second low speed shredders **24***a*, **24***b* rotate at a rotational speed of about 40-80 rpm and the agitator **26** rotates at a rotational speed of about 300-500 rpm. In other embodiments, the first and second low speed shredders **24***a*, **24***b* can rotate at rotational speeds less than or more than 40-80 rpm and the agitator **26** can rotate at rotational speeds less than or more than 300-500 rpm. In still other embodiments, the first and second low speed shredders **24***a*, **24***b* can rotate at rotational speeds different from each other.

Referring again to FIG. **3**, a discharge mechanism **28** is positioned adjacent to the agitator **26** and is configured to distribute the finely conditioned loosefill insulation material exiting the agitator **26** into an airstream. The finely conditioned loosefill insulation material is driven through the discharge mechanism **28** and through a machine outlet **32** by an airstream provided by a blower **34** and associated ductwork (not shown) mounted in the lower unit **12**. The blower **34** is mounted for rotation and is driven by a blower motor **35**. The airstream is indicated by an arrow **33** in FIG. **4**. In other embodiments, the airstream **33** can be provided by other methods, such as by a vacuum, sufficient to provide an airstream **33** driven through the discharge mechanism **28**.

Referring again to FIG. **3**, the blower motor **35** is illustrated. The blower motor **35** is configured for 120 volt alternating current (A.C.) operation and is sized to require a maximum current of 11.0 amps. Further, the blower motor **35** is of a flow-through type and has a maximum rotational speed in a range of about 30,000 revolutions per minute to about 40,000 revolutions per minute. The blower motor **35** is configured for pulse width modulation control, thereby allowing for fine control and variability in the rotational speed of the blower **34**. The variable rotational speed of the blower **34** will be discussed in more detail below.

Referring again to FIG. **3**, the first and second shredders **24***a*, **24***b*, agitator **26** and discharge mechanism **28** are mounted for rotation. They can be driven by any suitable means, such as by an electric motor **36**, or other means sufficient to drive rotary equipment. Alternatively, each of the first and second shredders **24***a*, **24***b*, agitator **26** and discharge mechanism **28** can be provided with its own source of rotation.

Referring again to FIG. **3**, the lower unit **12** includes a first shredder guide shell **70***a*, a second shredder guide shell **70***b* and an agitator guide shell **72**. The first shredder guide shell **70***a* is positioned partially around the first low speed shredder **24***a* and extends to form an arc of approximately 90°. The first shredder guide shell **70***a* has an inner surface **71***a* and an outer surface **71***b*. The first shredder guide shell **70***a* is configured to allow the first low speed shredder **24***a* to seal against the inner surface **71***a* of the shredder guide shell **70***a* and thereby urge loosefill insulation material in a direction toward the second low speed shredder **24***b*.

Referring again to FIG. **3**, second shredder guide shell **70***b* is positioned partially around the second low speed shredder **24***b* and extends to form an arc of approximately 90°. The second shredder guide shell **70***b* has an inner surface **73***a* and an outer surface **73***b*. The second shredder guide shell **70***b* is configured to allow the second low speed shredder **24***b* to seal against the inner surface **73***a* of the second shredder guide shell **70***b* and thereby urge the loosefill insulation in a direction toward the agitator **26**.

In a manner similar to the shredder guide shells, **70***a*, **70***b*, the agitator guide shell **72** is positioned partially around the agitator **26** and extends to form an arc of approximate 90°. The agitator guide shell **72** has an inner surface **75***a* and an outer surface **75***b*. The agitator guide shell **72** is configured to allow the agitator **26** to seal against the inner surface **75***a* of the agitator guide shell **72** and thereby direct the loosefill insulation in a downstream direction toward the discharge mechanism **28**.

In the embodiment illustrated in FIG. **3**, the shredder guide shells **70***a*, **70***b* and the agitator guide shell **72** are formed from a polymeric material. However, in other embodiments, the shells **70***a*, **70***b* and **72** can be formed from other desired materials including the non-limiting example of aluminum.

Referring again to FIG. **3**, the shredding chamber **23** includes a floor **38** positioned below the blower **34**, the agitator **26** and the discharge mechanism **28**. In the illustrated embodiment, the floor **38** is arranged in a substantially horizontal plane and extends substantially across the lower unit **12**. In the embodiment illustrated in FIG. **3**, the floor **38** is formed from a polymeric material. However, in other embodiments, the floor **38** can be formed from other desired materials including the non-limiting example of aluminum.

Referring again to FIGS. **1-4**, in operation, the inlet end **16** of the chute **14** receives compressed loosefill insulation material. As the compressed loosefill insulation material expands within the chute **14**, the chute **14** guides the loosefill insulation material past the outlet end **18** of the chute **14** to the shredding chamber **23**. The first low speed shredder **24***a* receives the loosefill insulation material and shreds, picks apart and conditions the loosefill insulation material. The loosefill insulation material is directed by the combination of the first low speed shredder **24***a* and the first shredder guide shell **70***a* to the second low speed shredder **24***b*. The second low speed shredder **24***b* receives the loosefill insulation material and further shreds, picks apart and conditions the loosefill insulation material. The loosefill insulation material is directed by the combination of the second low speed shredder **24***b* and the second shredder guide shell **70***b* to the agitator **26**.

The agitator **26** is configured to finely condition the loosefill insulation material and prepare the loosefill insulation material for distribution into the airstream **33** by further shredding and conditioning the loosefill insulation material. The finely conditioned loosefill insulation material, guided by the agitator guide shell **72**, exits the agitator **26** at an outlet end **25** of the shredding chamber **23** and enters the discharge mechanism **28** for distribution into the airstream **33** provided by the blower **34**. The airstream **33**, entrained with the finely conditioned loosefill insulation material, exits the insulation blowing machine **10** at the machine outlet **32** and flows through a distribution hose **46**, as shown in FIG. **4**, toward an insulation cavity, not shown.

Referring again to FIG. **3**, the discharge mechanism **28** has a side inlet **40** and an optional choke **42**. The side inlet **40** is configured to receive the finely conditioned blowing insulation material as it is fed from the agitator **26**. In the illustrated embodiment, the agitator **26** is positioned adjacent to the side inlet **40** of the discharge mechanism **28**. In other embodiments, the low speed shredders **24***a*, **24***b* or agitator **26**, or other shredding mechanisms can be positioned adjacent to the side inlet **40** of the discharge mechanism **28** or in other suitable positions.

Referring again to FIG. **3**, the optional choke **42** is configured to partially obstruct the side inlet **40** of the discharge mechanism **28** such that heavier clumps of blowing insulation material are prevented from entering the side inlet **40** of the discharge mechanism **28**. The heavier clumps of blowing insulation material are redirected past the side inlet **40** of the discharge mechanism **28** to the shredders **24***a*, **24***b* for recycling and further conditioning.

Referring again to FIG. **4**, and as described above, the airstream **33** exits the discharge mechanism **28** with the entrained finely conditioned loosefill insulation material. The airstream **33** is conveyed by the distribution hose **46** until the airstream **33** exits the distribution hose **46** at a hose outlet **48**. In certain instances, stray fibers of the finely conditioned loosefill insulation material can become airborne during the distribution process. The presence of these stray fibers in unwanted locations, such as on clothing, can be an unwanted nuisance.

Referring again to FIG. **1**, the machine **10** is illustrated with the lower unit **12** and the chute **14**. The chute **14** is configured to guide compressed loosefill insulation material through the interior of the chute **14** to the outlet end **18** of the chute **14**, wherein the loosefill insulation material is introduced to the shredding chamber **23**. The chute **14** includes a first portion **80** and a second portion **82**. The first portion **80** extends from the inlet end **16** to a side wall **84** and from a first portion front wall **86** to a first portion rear wall **88**. The inlet end **16**, side wall **84**, first portion front wall **86** and first portion rear wall **88** define a first portion internal passage **89**.

Referring again to FIG. **1**, the second portion **82** extends from a second portion side wall **90** to the side wall **84** and between the second portion front wall **92** to a second portion rear wall **94**. The second portion side wall **90**, side wall **84**, second portion front wall **92** and second portion rear wall **94** defined a second portion internal passage **91**. The first portion internal passage **89** and the second portion internal passage **91** are in fluid communication with each other.

Referring now to FIG. **5**, the first and second portions **80**, **82** of the chute **14** are illustrated. The first portion front wall **86** and the first portion rear wall **88** have a substantially vertical and parallel orientation, and are centered about a substantially vertical plane A-A.

Referring again to FIG. **5**, the second portion front wall **92** and the second portion rear wall have a parallel orientation and are centered about a plane B-B. The intersection of the planes A-A and B-B forms an angle α. As will be explained in more detail below, angle α is configured to provide a controlled descent for the loosefill insulation material as the loosefill insulation transitions from the chute **14** and enters the shredding chamber **23**.

In the embodiment of the chute **14** illustrated in FIG. **5**, the angle α is in a range of from about 140° to about 160°. However, in other embodiments, the angle α can be less than about 140° or more than about 160°, sufficient to provide a controlled descent for the loosefill insulation material exiting the chute **14** and entering the shredding chamber **23**.

Referring now to FIGS. **6**A and **6**B, operation of the chute will now be described. Referring first to FIG. **6**A, a package **100** of compressed loosefill insulation material is fed into the inlet end **16** of the chute **14** as illustrated by direction arrow D1. The package **100** includes compressed loosefill insulation material **102**. In this embodiment, the package **100** of compressed loosefill insulation material is fed into the inlet end **16** of the chute **14** in a manner such that the package **100** has a substantially vertical orientation. The term "substantially vertical orientation", as used herein is defined to mean opposing major sides of the package **100** are substantially parallel to an axis having a vertical orientation.

Referring again to FIG. **6**A, as the package **100** enters the chute **14**, the package **100** is initially guided within the first portion internal passage **89** by the first portion front wall **86** and first portion rear wall **88**, thereby maintaining the package **100** in a substantially vertical orientation.

Referring now to FIG. **6**B, the package **100** has proceeded into the chute **14** a distance sufficient that portions of the package **100** encounter the second portion rear wall **94**. The angle α formed by the first portion rear wall **88** and the second portion rear wall **94** is sufficient that a portion of the package **100** forms a bend **104**. As loosefill insulation material **102** expands and exits the package **100**, the bend **104** in the package **100** and the angle α formed by the second portion **82** of the chute **14**, cooperate to control the descent of the loosefill insulation material **102** into the shredding chamber **23**. Without being held to the theory, it is believed the controlled descent of the loosefill insulation material **102**, as the loosefill insulation material **102** enters the shredding chamber, helps prevents jamming of the low speed shredders **24***a*, **24***b*.

Referring now to FIG. **7**, a side view of the machine **10** is illustrated with the machine **10** having the lower unit **12** and chute **14**. The lower unit **12** includes a front panel **52**, the back panel **54** and a plurality of support segments **110** extending outwardly from the back panel **54**. In the illustrated embodiment, the back panel **54** has a substantially vertical orientation. The term "substantially vertical orientation", as used herein is defined to mean the back panel **54** is substantially parallel to plane C-C, with plane C-C having a vertical orientation.

Referring again to FIG. **7**, the lower unit **12** includes space apart wheels **112** configured for rotation about an axle **114**. A rotational center of the axle **114** is positioned within a vertical plane DA-DA. As shown in FIG. **7**, the vertical plane DA-DA, representing the rotational center of the axle **114**, is located a distance DS to the rear of the vertical plane C-C, representing the back panel **54** of the lower unit **12**. It is believed positioning of the rotational center of the axle **114** to the rear of the back panel **54** of the lower unit **12** advantageously increases the stability of the machine **10** during operating and transport.

Referring again to FIG. **7**, the distance DS is in a range of from about 1.0 inch to about 3.0 inches. Alternatively, the distance DS could be less than about 1.0 inch or more than about 3.0 inches, sufficient to increase the stability of the machine **10** during operating and transport.

Referring now to FIG. **8**, a side view of the machine **10**, lower unit **12** and chute **14** is illustrated. The chute **14** includes a lower extension **120** configured to seat within a mating cavity **122** formed at a top portion **124** of the lower unit **12**. In a seated position, a rim **126** extending circumferentially around a portion of the chute **14**, rests on the top portion **124** of the lower unit **12**. The lower extension **120** of the chute **14** includes a projection **130**, extending along a front edge **132** of the lower extension **120**. The projection **130** is configured to mate with a recess **136** located within the lower unit **12** and extending from the cavity **122**. The projection **130** is configured for several functions. First, the projection **130** is configured to slide into the recess **136** in the lower unit **12**. Second, the projection **130** is configured to orient the chute **14** in a desired arrangement relative to the lower unit **12**. Finally, once in a seated orientation, the projection **130** is configured for contact with the recess **136** such that the chute **14** cannot be lifted from the lower unit **12** without rotation of the chute.

In the embodiment illustrated in FIG. **8**, the projection **130** has the cross-sectional form of a lip and the recess **136** has a matching concave cross-sectional shape. However, in other embodiments, the projection **130** and the mating recess **136** can have other cross-sectional shapes sufficient for the functions discussed above.

Referring now to FIG. **2**, once the projection (not shown) extending from the chute **14** is seated with the recess (not shown) in the chute **14**, the lower unit **12** and the chute **14** can be secured together with a clasp **140**. The clasp **140** extends between the lower unit **12** and the chute **14** and is positioned at the rear of the lower unit **12** and the chute **14**. In the illustrated embodiment, the clasp **140** has the form of a spring-loaded toggle latch. However, the clasp can have other desired forms sufficient to secure the lower unit **12** to the chute **14** once the projection extending from the chute **14** is seated within the recess of the lower unit **12**.

Referring again to FIGS. **2** and **8**, the combination of the mating projection **130** and recess **136** and the clasp **140** provides several advantages, although all advantages may not be present in all embodiments. First, use of the use of mating projection **130** and recess **136** provides that the chute **14** cannot removed from the lower unit **12** without a deliberate rotation of the chute **14**. Second, use of the use of mating projection **130** and recess **136** provides that the chute **14** cannot be assembled to the lower unit **12** with an incorrect orientation. Third, use of a single clasp **140** provides a time savings over the use of multiple clasps. Finally, positioning of the clasp **140** at the rear of the machine **10**, advantageously moves a potential catch point out of the way of users of the machine.

Referring now to FIGS. **9**-**11**, the machine **10** can be configured for use in distributing loosefill insulation material to areas with a confined access, such as for example wall cavities formed within existing walls. To limit the repair to the existing walls, it is desirable to limit the number and size of the penetrations made to the existing wall. Referring now to FIG. **11**, in certain instances, it is also desirable to distribute the loosefill insulation material from an access point **200** positioned at a lower portion **202** of a wall **204**. In this scenario, the distribution hose **46** extends in an upward position within an insulation cavity **206** formed within the wall **204**.

Referring again to FIGS. **9**-**11**, a distribution hose assembly is illustrated generally at **210**. The distribution hose assembly **210** includes the distribution hose **46**, a transition element **212**, a second distribution hose **214**, a plurality of connection ports **216**, a corresponding plurality of reinforcing members **218** and a plurality of spaced apart connecting members **220**.

Referring now to FIG. **9**, the transition element **212** is configured to receive the distribution hose **46** and couple the distribution hose **46** with the second distribution hose **214**. The transition element **212** includes a first internal passage **213***a* and a second internal passage **213***b*. The first internal passage **213***a* has a diameter DT**1** that approximates an outer diameter of the distribution hose **46** and the second internal passage **213***b* has a diameter DT**2** that approximates the outer diameter of the second distribution hose **214**. The transition element **212** is configured to provide a reduction in the diameter of the airstream flowing from the distribution hose **46** to the second distribution hose **214**. Reducing the airstream to the smaller diameter of the second distribution hose **214** advantageously allows an installer to cut smaller access holes **200** in the wall **204** and further minimizes the aesthetic impact to the building.

Referring again to FIG. **9**, the transition element **212** includes a transition angle β. The transition angle β is configured for several functions. First, the transition angle β is configured to minimize accumulation of loosefill insulation material within the transition element **212**. Second, transition angle β is configured to accelerate the flow of the airstream and the entrained loosefill insulation material into the second distribution hose **214**, thereby enabling a more effective filling of the wall cavity **206**. In the illustrated embodiment, the transition angle β is in a range of from about 30° to about 40°. However, in other embodiments, the transition angle β can be less than about 30° or more than about 40°, sufficient to achieve the functions described above.

Referring again to FIG. **9**, the connection ports **216** are integrated into the transition element **212** and configured to secure the reinforcing members **218**. In the illustrated embodiment, the connection ports **216** include an aperture **217** configured to receive the reinforcing members **218** with a friction fit. Alternatively, other mechanisms devices and structures can be used to secure the reinforcing members **218** to transition element **212**, such as the non-limiting examples of clips and clamps.

Referring again to FIG. **9**, reinforcing members **218** are positioned adjacent to and generally parallel with the second distribution hose **214** and are configured to limit bending movement of the second distribution hose **214**, thereby maintaining the second distribution hose **214** in a generally straight and upright orientation within the wall cavity **206**. The straight and upright orientation of the second distribution hose **214** advantageously prevents the second distribution hose **214** from coiling within the wall cavity **206**, thereby providing the installer with more control over the distribution process. In the illustrated embodiment, the reinforcing members **218** are formed from a fiberglass-based material in a rod-like form configured to provide sufficient rigidity to maintain the second distribution hose **214** in a generally straight and upright orientation. In other embodiments, the reinforcing members **214** can be formed from other materials, such as for example aluminum and can have other forms, such as for example connected segments, sufficient to maintain the second distribution hose **214** in a generally straight and upright orientation. In the embodiment illustrated in FIG. **9**, a quantity of two (2) reinforcing members **218** are illustrated. Alternatively, more or less than two (2) reinforcing members **218** can be used, sufficient to maintain the second distribution hose **214** in a generally straight and upright orientation.

Referring now to FIGS. **9** and **10**, the connecting members **220** are spaced apart along the length of the second distribution hose **214** and are configured to attach the reinforcing members **218** to the second distribution hose **214**. In the illustrated embodiment, the connecting members **220** are spaced apart by a distance in a range of from about 12.0 inches to about 36.0 inches, however, other desired intervals can be used. Advantageously, positioning the connecting members **220** at spaced apart intervals provides the installer with an easy means to gauge the length of the second distribution hose **214** that has been inserted into the wall cavity **206**.

Referring now to FIG. **9**, the connecting member **220** includes a first aperture **221** configured to receive a portion of the second distribution hose **214**. In the illustrated embodiment, the aperture **221** has an inner diameter that is smaller than the outer diameter of the second distribution hose **214**, such that the second distribution hose **214** does not move along the length of the second connecting member **220**. The connecting member **220** includes a plurality of projections mounts **230**, with each of the mounts **230** having an aperture **231**. The apertures **231** are configured to receive the reinforcing members **218** and secure the reinforcing members **218** with a friction fit. In this manner, the connecting members **220** are configured to support the second distribution hose **214**.

The principle and mode of operation of the loosefill insulation blowing machine have been described in certain embodiments. However, it should be noted that the loosefill insulation blowing machine may be practiced otherwise than as specifically illustrated and described without departing from its scope.

What is claimed is:

1. A machine for distributing loosefill insulation material from a package of compressed loosefill insulation material, the machine comprising:

a chute having an inlet end and an outlet end, the inlet end configured to receive compressed loosefill insulation material, the chute having a first portion in fluid communication with a second portion, the first portion forming an angle with the second portion, wherein the first portion of the chute is defined by a first portion front wall and a first portion rear wall, wherein the first portion front and rear walls are parallel with each other, wherein the second portion of the chute is defined by a second portion front wall and a second portion rear wall, wherein the second portion front and rear walls are parallel with each other, wherein the first portion front wall forms an angle with the second portion front wall, and wherein the angle is in a range of from 140 degrees to 160 degrees;

a shredding chamber configured to receive the compressed loosefill insulation material from the outlet end of the chute, the shredding chamber including a plurality of shredders configured to shred, pick apart and condition the loosefill insulation material thereby forming conditioned loosefill insulation material;

a discharge mechanism mounted to receive the conditioned loosefill insulation material exiting the shredding chamber, the discharge mechanism configured to distribute the conditioned loosefill insulation material into an airstream; and

a blower configured to provide the airstream flowing through the discharge mechanism;

wherein the angle between the first portion of the chute and the second portion of the chute is configured to form a bend in the package of compressed loosefill insulation material, and wherein the bend in the package of compressed loosefill insulation material is configured to control the descent and direction of the loosefill insulation material entering the shredding chamber.

2. The machine of claim **1**, wherein the angle formed between the first portion of the chute and the second portion of the chute is in a range of from 140 degrees to 160 degrees.

3. The machine of claim **1**, wherein the second portion includes the outlet end.

4. A machine for distributing loosefill insulation material from a package of compressed loosefill insulation material, the machine comprising:

a chute having an inlet end and an outlet end, the inlet end configured to receive compressed loosefill insulation material, the chute having a lower extension, the lower extension having one projection that extends across only a front edge of the lower extension;

a lower unit having a shredding chamber configured to receive the compressed loosefill insulation material from the outlet end of the chute, the shredding chamber including a plurality of shredders configured to shred, pick apart and condition the loosefill insulation material, the lower unit having a cavity configured to receive the lower extension of the chute, only one wall of the cavity having one recess formed therein;

a discharge mechanism mounted to receive the conditioned loosefill insulation material exiting the shredding chamber, the discharge mechanism configured to distribute the conditioned loosefill insulation material into an airstream; and

a blower configured to provide the airstream flowing through the discharge mechanism;

wherein the chute and the lower unit are secured together in a manner such that the one projection is aligned with, and nests within, the one recess, and that requires rotation of the chute to separate the chute from the lower unit.

5. The machine of claim **4**, wherein the projection has the cross-sectional shape of a lip.

6. The machine of claim **4**, wherein removal of the chute requires rotation of the chute about the projection.

7. The machine of claim **4**, wherein a clasp is positioned opposite a combination of a projection and a recess and is configured to secure the chute to the lower unit.

8. The machine of claim **4**, wherein the projection has an arcuate portion configured to seat in the recess of the cavity.

9. The machine of claim **8**, wherein the recess extends across a top portion of the lower unit.

10. A machine for distributing loosefill insulation material from a package of compressed loosefill insulation material, the machine comprising:

a chute having an inlet end and an outlet end, the inlet end configured to receive compressed loosefill insulation material, the chute having a first portion in fluid communication with a second portion, the first portion forming an angle with the second portion, wherein the first portion of the chute is defined by a first portion front wall and a first portion rear wall, wherein the first portion front and rear walls are parallel with each other, wherein the second portion of the chute is defined by a second portion front wall and a second portion rear wall, wherein the second portion front and rear walls are parallel with each other, wherein the first portion rear wall forms an angle with the second portion rear wall, and wherein the angle is in a range of from 140 degrees to 160 degrees;

a shredding chamber configured to receive the compressed loosefill insulation material from the outlet end of the chute, the shredding chamber including a plurality of shredders configured to shred, pick apart and condition the loosefill insulation material thereby forming conditioned loosefill insulation material;

a discharge mechanism mounted to receive the conditioned loosefill insulation material exiting the shredding chamber, the discharge mechanism configured to distribute the conditioned loosefill insulation material into an airstream; and

a blower configured to provide the airstream flowing through the discharge mechanism;

wherein the angle between the first portion of the chute and the second portion of the chute is configured to form a bend in the package of compressed loosefill insulation material, and wherein the bend in the package of compressed loosefill insulation material is configured to control the descent and direction of the loosefill insulation material entering the shredding chamber.

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